09/926475

P21550

JC17 Rec'd PCT/PTO 09 NOV 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : T. JØNSSON et al.

Appl No. : Not Yet Assigned PCT Branch

I.A. Filed : 12 May 2000 PCT/DK00/00252

For : FOOD COMPOSITIONS WITH HIGH SOLIDS CONTENT, A METHOD FOR ITS PREPARATION AS WELL AS THE USE OF CARRAGEENANS FOR GELLING A FOOD COMPOSITION

CLAIM OF PRIORITY

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Sir:

Applicant hereby claims the right of priority granted pursuant to 35 U.S.C. 119 based upon Danish Application No.PA1999 00650 filed May 12, 1999. The International Bureau already should have sent a certified copy of the Danish application to the United States designated office. If the certified copy has not arrived, please contact the undersigned.

Respectfully submitted,
T. JØNSSON et al.

Arnold Turk
Reg. No. 33,094

November 9, 2001
GREENBLUM & BERNSTEIN, P.L.C.
1941 Roland Clarke Place
Reston, VA 20191
(703) 716-1191

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

DK00/252

PCT/DK00/00252

RO/DK 12 MAY 2000

Kongeriget Danmark

09/926475

Patent application No.: PA 1999 00650

09/926475

Date of filing: 12 May 1999

Applicant: Hercules Incorporated
Hercules Plaza
1313 North Market Street
Wilmington, Delaware 19894, US
US

This is to certify the correctness of the following information:

The attached photocopy is a true copy of the following document:

- The specification, claims abstract and drawing as filed with the application on the filing date indicated above.

Patent- og Varemærkestyrelsen • Kongeriget Danmark •

Patent- og Varemærkestyrelsen
Erhvervsministeriet

TAASTRUP 06 April 2000

Lizzi Vester

Lizzi Vester
Head of Section

Chas. Hude

Patents · Trade Marks · Designs

PATENTS
Tage N[illegible] c •
Ulrik Nørgaard ° •
Ole Thierry-Carstensen ° •
Hans P Mathiesen ° •
Jørgen Siiger ° •
Henrik Zeuthen-Aagaard ° •
Ulla C. Klinge ° •
Peter Kim Jensen ° •
Erik Lichtenberg ° •
Bent Christensen ° •
Henrik Dylmer
Peter Englev ° •
Lise Tølbøll
Susanne Nord *secretarial*
Kirsten M. Jensen *annuities*

SEARCHES
Åse Damm

TRADE MARKS AND DESIGNS
Kaj L. Henriksen °□
Henrik Jespersen °□
Claus Hyllinge °
Birgitte Waagepetersen °□
Christian Kragelund
Peter Larsen °□
Inge Petersen *renewals*
Sonja Nielsen *assignments*

ACCOUNTING/DP
Steffen Hussing

° *Member of The Association of Danish Patent Agents*
• *European Patent Attorney*
□ *European Trade Mark Attorney*

71189 UCK/LT/Ve

Modtaget PD
12 MAJ 1999

Pat appln No

Hercules Inc.
Hercules Plaza
1313 North Market Street
Wilmington, Delaware 19894
USA

Food Composition with High Solids Content, A Method for Its Preparation as well as the Use of Carrageenans for Gelling a Food Composition

---

Chas. Hude A/S
H.C. Andersens Boulevard 33
DK-1553 Copenhagen V
Denmark

Telephone
(+ 45) 33 15 45 14
E-mail
chashude@chashude.dk

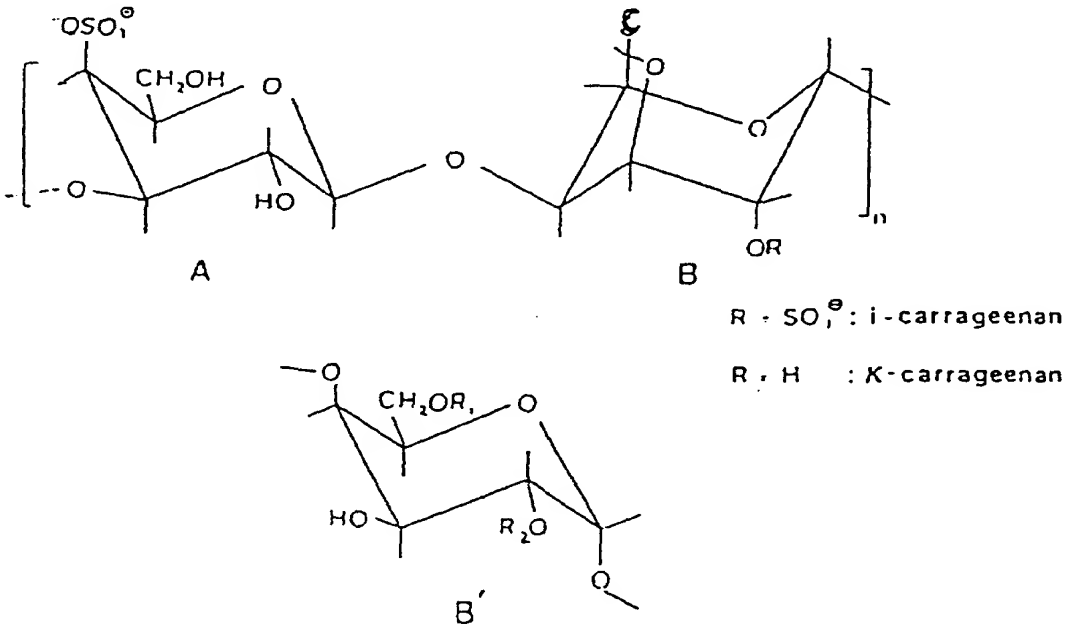
Telefax
(+ 45) 33 15 45 35 (Pat.)
(+ 45) 33 15 51 08 (TM)

Telex
19 538 hude dk

Postal cheque (giro): 500-0599
Bank: Unibank 5501-5010120700
Tax I.D./VAT No.: DK 12938179
A/S Reg. No. 179.446

carrageenan, kappa carrageenan and lambda carrageenan, of which only iota and kappa carrageenans have gelling properties.

A general formula for carageenan is disclosed by Nijenhuis, K. in Advanced Polymer Science, 130, 203-18, (1997):



Idealised AB repeating unit of iota and kappa carrageenan polymers based on 1,3-linked β-D-galactose residue (A) and 1,4-linked 3,6-anhydro-α-D-galactose residue (B). The sequence is broken occasionally by residues of the general type B'.

Stortz, C.A. and Cerezo, A.S. describe in Carbohydrate Research, 145 (1986), 219-235, the different members of the carrageenan family by their idealised repeating units:

Technical Field

This invention relates to a food composition having high solids content, a method for its preparation as well as the use of carrageenans for gelling a food composition. More particularly, this invention relates to confectionery products such as e.g. soft candies comprising as gelling agent one or more carrageenans, a method for the preparation thereof as well as the use of carrageenans for gelling a food composition.

Background Art

Food compositions having high solids content,such as confectionery products, e.g. soft candies or wine gum, are conventionally gelled by the use of gelatine, a heterogenous mixture of water-soluble high molecular weight proteins. Gelatine is derived from collagen, usually by boiling animal hides or bones.

Despite its excellent gelling capability, gelatine suffers from a number of drawbacks which can be attributed to its animal origin. Thus, gelatine is unacceptable to those of Muslim and Jewish faith, as it is often prepared from swine skin. Further, recently the use of gelatine in foods has been questioned due to the possible link between consumption of foods containing gelatine of bovine origin and the occurrence of the Creutzfeldt-Jakob disease. Finally, the consumption of animals and animal-derived foods may be objectionable for some from an ethical point of view.

There is therefore a need for a vegetable alternative to gelatine.

One such alternative is carrageenan. Carrageenans extracted from seaweed are known to be useful as thickening, viscosifying and gelling agents. Carrageenans are polysaccharides consisting of alternating copolymers of $\beta(1\rightarrow3)$-D-galactose and $\alpha(1\rightarrow4)$-3,6-anhydro-D-galactose units. Several members of the carrageenan family are known, differing in their amounts of sulfate ester and/or other substituent groups, viz iota

Carrageenan	3-linked residue	4-linked residue
Beta	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Kappa	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Iota	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose 2-sulfate
Mu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 6-sulfate
Nu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 2,6-disulfate
Lambda	Beta-D-galactopyranose 2-sulfate (70%) and Beta-D-galactopyranose (30%)	Alpha-D-galactopyranose 2,6-disulfate
Theta	Beta-D-galactopyranose 2-sulfate	3,6-anhydro-alpha-D-galactopyranose-2-sulfate
Xi	Beta-D-galactopyranose 2-sulfate	Alpha-D-galactopyranose 2-sulfate

However, it is well-known to anyone skilled in the art that the solubility of carrageenans in systems of high soluble solids content is very limited,see e.g."Carrageenan" by W.R. Thomas in Thickening and Gelling Agents for Food, Ed. A. Imeson, 1992, from which it appears that iota carrageenan is insoluble at soluble solids contents of 50% and above, whereas kappa carrageenan is only hot soluble at 50% soluble solids (SS) content. Consequently, carrageenans have in the past mainly been used either in lower SS systems or in systems not requiring any gel formation.

US 5,631,034 discloses a method for preparing an aqueous sugar frosting mix comprising from about 70 to about 90 % by weight of sugar, from about 9 to about 29% by

weight of aqueous liquid and from about 0.05 to about 1.0% by weight of a crystal growth inhibitor. Said crystal growth inhibitor may be a carrageenan. The purpose of the use of carrageenan in this system is to inhibit crystal growth of the sugar and to provide binding properties of the sprayable solution.

US 5,306,519 discloses a syrup composition having a sufficiently low viscosity so that it can be poured or pumped yet upon contact with a calcium containing confection its viscosity increases. Said syrup comprises from about 25 to about 60 % sugar solids, water, at least one sequestrant, and an amount of at least one calcium reactive gum sufficient to thicken the syrup upon contact with the calcium containing confection. Said calcium reactive gum may be a carrageenan which may be incorporated into the syrup at a level from about 0.05 to about 0.5 %, preferably from about 0.1 to 0.3 %.

WO 95/12985 discloses an injectable fondant and method of manufacturing same. Said injectable fondant presents in its cooled state, at least 0,5 day after manufacture, a solids content of 68 - 75 % by weight, including less than 1 % by weight of stabiliser. Said stabiliser may be a carrageenan.

US 5,607,716 discloses a low or no fat, water and sugar based high solid confection comprising at least 80 % to 90 % total solids by weight, wherein the carbohydrate content is at least 70 % by weight of the total solids, a cation containing edible material, a cation reactive and thermosensitive hydrocolloid, and up to 7 % by weight of fat, said confection having a water activity below 0.65 and a pH from 3.0 to 8.5. The hydrocolloid may be a carrageenan in an amount of from 0.25 to 3.5 % by weight.

US 5,132,128 discloses a dessert topping having a pH greater than 4,6 and having a water activity of less than 0,84 and comprising a blend of carrageenan gum, a powdered cellulose bulking agent, a non-heat thinning cellulose gum bulking agent, high fructose corn syrups, an edible humectant and non-fat milk. The carrageenan gum may be used in an amount in the range of 0.75-1.75 % by weight of said topping, and the high fruc-

tose corn syrup is in the range of 50-60 % by weight of said topping. Said blend of carrageenan gum provides both gelling and viscosity control in order to obtain a suitable low viscosity upon heating while providing a viscous texture of the topping when placed on a dessert, particularly ice cream.

EP 0 045 522 A2 discloses edible food containers for use with a food product by applying a barrier coating composition to at least the interior surface thereof. The barrier coating composition comprises a sugar solution having a sugar content of at least 50% by weight and optionally other ingredients such as a flavour-producing material or a vegetable gum. Said gum material, which may be a carrageenan, may be present in an amount of about 0.1 to 2% by weight. The barrier coating composition forms a film, which through the use of said gum material adheres to the inner surface of the food container.

EP 0 366 248 A2 discloses preservative compositions for fruits and vegetables comprising antidiscolouration agent and edible thixotropic gum. A typical composition may contain 20-60% by weight of edible bulk filler (eg maltodextrin, preferably a low dextrose equivalent maltodextrin), 20-60 % ascorbic acid and 1-50 % edible thixotropic gum and 1-25 % natural or artificial flavouring. Thus, a thixotropic material is provided.

WO 98/20860 discloses a chewable composition for delivery of a pharmacologically active material to a user comprising sweetener, carrageenan and water, said composition comprising from about 50 to about 83 % of solids. Carrageenan may be present in an amount from about 2% to 5,5% and optionally one or more of an additional hydrocolloid is present in a total amount of from about 0.5 % to about 2% . Any suitable sweetener may be used.

EP 0 273 001 discloses a soft, sugarless, aerated confectionery comprising soluble solids in the form of hydrogenated starch hydrolysates in the range from 35 to 89% by weight and up to 5.5 % by weight of hydrocolloid such as a seaweed extract.The disclosed

confectionery does not include any sugar and is deposited at temperatures of about 130 to 140° C.

US 5,603,979 discloses a method for the preparation of a fat-free peanutbutter like product comprising 15-40% by weight of water, 0.5 - 1.5 % by weight of natural gum, 5-20% by weight of peanut flour, 20 - 35% by weight of syrup and 5-13 % by weight of humectant. Carrageenan may be used as gum component. The product obtained must be spreadable.

Thus, as can be seen, it has hitherto not been possible to disperse efficiently a carrageenan in a high solids system at a temperature of below 100° C at atmospheric pressure in order to form a gelled end-product, in which said carrageenan provides the main gel structure and texture.

Brief Description of the Invention

The object of the present invention is thus to provide a food composition having high soluble solids content comprising a gelling agent, which is vegetable based, which has a sufficiently low viscosity during depositing in e.g. moulds, which gels rapidly and which can successfully be produced at temperatures not requiring special apparatuses or arrangements to be met.

In its first aspect, the present invention relates to a food composition comprising soluble solids in the range of 50% to 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance.

In a second aspect, the present invention provides a process for producing a food composition as defined above comprising (a) dispersing carrageenan in a syrup of a non sucrose sweeetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing of the mixture, and (e) cooling of said mixture to below the depositing temperature of said mixture.

As used herein, the term "depositing temperature" means the lowest temperature, at which depositing is possible, i.e. at which temperature the food composition is still flowable, such as through a "Mogul"® depositor.

In a third aspect, the present invention provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30.

Brief Description of the Drawing

Fig. 1 illustrates the textural behaviour of two different food compositions according to the invention, the curves marked (•) and (▲), respectively, as well as two reference compositions, gelled by means of pection (▼) and gelatine (■), respectively.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the scope of the invention will become apparent to those skilled in the art from this detailed description.

Detailed description/Best mode for carrying out the invention

The food composition according to the invention in a preferred embodiment comprises a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of 0:100 to 95:5, wherein the non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.

In a particularly preferred embodiment of the present invention, said non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE of at least about 40, preferably a DE > 40 fructose or glucose syrup.

As used herein, the term "DE" stands for "Dextrose Equivalent". DE indicates the degree to which a carbohydrate starting material has been decomposed to dextrose.

Thus, it has been found that at DE values below about 30, the carrageenan employed will swell excessively, leading to excessive gelling causing a depositing temperature well above 100° C. However, depositing temperatures of above 100° C are undesirable from a practical point of view, necessitating special precautions and requirements in terms of e.g. apparatus.

By employing the above mentioned sweetening system, it has, however, surprisingly been shown that it is possible to dissolve a carrageenan component in a high solids system of about 50 to about 90% by weight of soluble solids using a minor amount of water. A particular advantage of the present invention is thus the fact that the amount of water added can be limited compared to a conventional process whereby less energy is needed for the subsequent evaporation thereof to obtain a final product of a desired soluble solids content. The present invention thus represents a substantially increased process efficiency.

In another embodiment of the present invention, the sucrose can be replaced wholly or partly by an aqueous solution of a sugar alcohol, such as sorbitol, mannitol, xylitol, isomalt, lactitol, maltitol or a maltitol syrup.

In a preferred embodiment of the present invention, the sweetening system comprises sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2. Thus, it has been found that at the disclosed ratios, an acceptable sweetness level still providing a composition having a depositing temperature of less than 100° C is obtained.

In a particularly preferred embodiment, the non sucrose sweetener is a fructose or glucose syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to about 70, especially about 60. Said embodiment provides the optimum characteristics in terms of sweetness level, texture and solubility of the gelling agent.

Advantageously, at least about 80%, preferably at least about 90% of the soluble solids are comprised by the above sweetening system. Thus, it has been shown that even at such high concentrations of sweetening system a gelled product having a satisfactory depositing temperature may be obtained.

As carrageenan component an iota carrageenan or a kappa carrageenan or mixtures thereof are employed, preferably in an amount of about 0.25 to 10% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition. Suitable carrageenans are commercially available as e.g. GENUTINE® type X-8300 and X-8302 from Copenhagen Pectin A/S, Denmark, or GENUGEL® type WR-713, likewise available from Copenhagen Pectin A/S.

Further, one or more additional hydrocolloids may be employed in combination with the above disclosed carrageenans to provide a particular gelling property, such as pectin,

e.g. GENU Pectin, available from Copenhagen Pectin A/S, agar-agar, e.g. GENU Agar, available from Copenhagen Pectin A/S, cellulose, such as AVICEL®, cellulose extracts and derivatives such as carboxy methyl cellulose (CMC), e.g. Blanose cellulose gum, methyl cellulose, e.g. Benecel®, hydroxy propyl cellulose, e.g. Klucel, hydroxy propyl methyl cellulose and mixtures thereof, starch, such as Avebe ® Perfectagel MPT, Avebe ® Perfectagel 928 and Avebe ® Perfectamyl Gel MB, alginates, xanthans, curdlan, gelatine, guar, locust bean gum, tara gum, karaya gum, furcellaran, tragacanth, and gum arabic, generally in an amount of up to about 10% by weight.

As further optional ingredients, conventional additives to obtain a desired, tasty food composition, may be added, such as conventional milk solids, vitamins, minerals, food grade acids and salts thereof, flavourings, colourings, artificial sweeteners, preservatives, etc..

Suitable food grade acids comprise inter alia citric acid, fumaric acid, acetic acid, malic acid, ascorbic acid, tartaric acid, lactic acid, sorbic acid and mixtures thereof.

As flavourings may be employed any food grade flavourings desired for the particular purpose, such as fruit flavours, e.g. strawberry, raspberry, orange or lemon, vanilla, peppermint, wintergreen, cinnamon, liquorice, etc. Further food grade colourings may be added to obtain a desired appearance of the food composition.

Optionally, one or more artificial sweeteners may be employed in order to obtain a particular sweetness level, such as saccharin and salts thereof, cyclamate salts, acesulfame K, aspartame, alitame, neohesperidin DC, sucralose, stevioside, and thaumatin.

As preservatives any approved preservative may be used, such as benzoic acid, sorbic acid and salts and esters thereof.

It has been found that the above disclosed food composition allows obtention of a lowering of the gelation temperature of the food composition in question such that a depositing temperature of below 100°C is obtained. A lowering of the gelation temperature and, consequently, the depositing temperature represents a substantial improvement in the confectionery industry, since less complicated apparatuses and simpler and more cost effective production methods may be employed during manufacture. Generally, a depositing temperature in the range of about 45 to 99° C, particularly of about 60 to 95° C, is preferred.

The food composition according to the invention is in a preferred embodiment a high sugar confectionery, such as soft candies, e.g. wine gums. Thus, it has been shown that the present invention provides a food composition having a unique new texture resembling the chewiness conventionally obtained by means of gelatine as gelling agent.

The food composition in another embodiment of the invention is an aerated confectionery and further comprises a whipping agent. Aerated confectioneries, such as marshmallows, can thus successfully be prepared by the present invention.

Further, the food composition according to the invention can take the form of glazings.

It must be appreciated, however, that the present invention is not limited to the above disclosed specific embodiments. On the contrary, the present invention may be employed to produce a variety of other high sugar confectioneries, such s gummy candies, chews, leathers, angel kisses, chocolate containing candies, fillings, reversible glazings, heat stable glazings, thixotrophic glazings, nappages, lollypops, liqourice products, candy bars, jelly beans and pastils etc.

The present invention also provides a process for producing the food composition according to the invention by (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while

stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing of the mixture and (e) cooling of said mixture to below the despositing temperature of said mixture. Any sucrose to be employed in order to obtain a desired sweetness level is added after heating the mixture to the boiling point thereof.

The food composition obtained through the above process is preferably deposited in moulds and left to stand for a few minutes up to about one hour. Thus, whereas prior art gelatine gelled confectioneries tend to adhere to moulds of plastics and metal and consequently have to be deposited in starch moulds and necessitates standing for up to a week in order to obtain a final texture, the food composition according to the invention gels instantaneously, can be deposited in metal and plastic moulds and can be demoulded within minutes up to about one hour.

Any further ingredients of the food composition, such as food grade acid, flavouring, colouring, artificial sweeteners or preservatives are preferably added after adjustment of the soluble solids content in step (c). In the case of production of aerated confectioneries, a whipping agent is separately mixed with water and any icing or confectioner's sugar and beaten to a stiff foam before addition to the high solids composition.

While the above disclosed process is the preferred one, the present invention is not limited thereto. Thus, the food composition according to the invention may also be produced by a process, whereby carrageenan is dispersed in sucrose, if any, the dry mixture obtained is dissolved in water and heated, non sucrose sweetener and optionally any additional sucrose is added to the hot mixture, whereupon the soluble solids content is adjusted to the desired level. Finally, the product obtained is cooled to below the depositing temperature. The latter process is particularly useful in connection with the preparation of glazings.

Further, the food composition according to the invention may be prepared by dispersing carrageenan in water while heating, adding said dispersion to a hot sweetener solution, whereupon the soluble solids content is adjusted to the desired level and any additional ingredients are added.

The present invention also provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30. The carrageenan component is preferably an iota carrageenan or a kappa carrageenan or mixtures thereof.

Thus, a vegetable alternative to gelatine has been provided giving a product of a similar texture as gelatine gelled products and which allows the preparation of food compositions of high soluble solids content in a cost and energy efficient, industrially applicable process.

Examples

In the examples given below the following apparatus and chemicals have been used to prepare and test food compositions according to the invention:

Apparatus:

- Texture Analyzer, TA-XT2. 5 kg. Software Texture Expert™, manufactured by Stable Micro Systems, England.

Chemicals:

- Sucrose, food grade, Danisco A/S, Denmark
- Citric acid, monohydrated, MERCK in 50% w/v solution
- Tri-sodium citrate, $2H_2O$, MERCK
- GENUTINE™ carrageenan types X-8302 and X-8300, Copenhagen Pectin A/S, Denmark
- GENUGEL® carrageenan type WR-713, Copenhagen Pectin A/S, Denmark
- Glucose syrup (DE-39) 83% SS, IGOS, Denmark
- High Iso Fructose FT-1750 (DE-95), Cerestar, Denmark
- Glucose HMF 70.9, 80% SS, Cargill, The Netherlands
- Invert syrup (DE 95)
- Glucose syrup FT 01700 (DE 62-64), Cerestar, Denmark
- Hyfoama® DSN whipping agent.

Example 1.1

Preparation of a gelled soft candy (wine gums) containing 60% SS and a ratio of DE 40 glucose syrup:DE 95 fructose syrup:sucrose of 27:13:60.

362.2 g of DE 40 glucose syrup and 207.8 g of DE 95 fructose syrup (components A) are heated to about 60°C in a sauce pan. 50.0 g of iota carrageenan (component B) is added to the syrup while stirring with a high speed mixer.

Upon complete dispersion of the carrageenan 870.6 g of water and a buffering agent in the form of 20.8 g of tri-sodium citrate (components C) are added to the slurry which is then heated to the boiling point (100°C) while stirring.

Thereafter 659.6 g of sucrose (component D) is added to the slurry which is then boiled (100°C) while stirring to adjust the content of soluble solids to 60% by weight by

evaporation of water.

To this slurry 40.0 g of 50% w/v citric acid (component E) is added in order to obtain a pH of about 3.8 while stirring to obtain a total of 2 kg of final slurry.

The slurry is then poured into a hot depository funnel and filled into moulds. After depositing for about one hour a soft candy with a firm and chewy texture is obtained. The depositing temperature of the individual samples is noted. The average depositing temperature of slurry 1.1 is presented in table V together with the texture of the deposited slurries, as well as their pH and content of soluble solids tested according to the measurement methods given below.

Examples 1.2 to 4.4

Table I provides a recipe for preparing the soft candies according to examples 1.2 to 4.4. The amount of each ingredient used in the preparation of these are given in grams per 100 grams of final slurry. The method of preparation is performed analogously to Ex. 1.1.

Table I

Ingredients added in the preparation of soft candies (wine gums) according to the examples 1.1 to 4.4

Component	Ingredients	%SS	Ex. 1.1		Ex. 1.2		Ex. 1.3		Ex. 1.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	40 DE syrup	84	18.11	15.21	21.37	17.95	24.63	20.69	26.26	22.06
	60 DE syrup	80	0.00	0	0.00	0	0.00	0	0.00	0
	95 DE fructose syrup	70	10.39	7.27	12.26	8.58	14.13	9.89	15.07	10.55
B	GENUTINE® carrageenan	100	2.50	2.5	2.50	2.5	2.50	2.5	2.50.	2.5
	GENUGEL® carrageenan	100	0.00	0	0.00	0	0.00	0	0.00	0
C	Water 1:1	0	43.53	0	32.44	0	21.36	0	15.82	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	32.98	32.98	38.93	38.93	44.88	44.88	47.85	47.85
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

Table I (cont.)

Component	Ingredients	%SS	Ex. 2.1		Ex. 2.2		Ex. 2.3		Ex. 2.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	40 DE syrup	84	0.00	0	0.00	0	0	0	0.00	0
	60 DE syrup	80	55.13	44.1	65.06	52.05	75	60	79.96	63.97
	95 DE fructose syrup	70	0.00	0	0.00	0	0	0	0.00	0
B	GENUTINE® carrageenan	100	2.50	2.5	2.50	2.5	2.5	2.5	2.50	2.5
	GENUGEL® carrageenan	100	0.00	0	0.00	0	0	0	0.00	0
C	Water 1:1	0	38.52	0	26.53	0	15	0	8.55	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41	15	15.46	16.49	16.49
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

Table I (cont.)

Component	Ingredients	%SS	Ex. 3.1		Ex. 3.2		Ex. 3.3		Ex. 3.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	40 DE syrup	84	0.00	0	0.00	0	0.00	0	0.00	0
	60 DE syrup	80	0.00	0	0.00	0	0.00	0	0.00	0
	95 DE fructose syrup	70	63.00	44.1	74.36	52.05	85.71	60	91.39	63.97
B	GENUTINE® carrageenan	100	2.50	2.5	2.50	2.5	2.50	2.5	2.50	2.5
	GENUGEL® carrageenan	100	0.00	0	0.00	0	0.00	0	0.00	0
C	Water 1:1	0	30.64	0	17.23	0	3.83	0	-2.88	
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41	15.46	15.46	16.49	16.49
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

Table I (cont.)

Component	Ingredients	%SS	Ex. 4.1		Ex. 4.2		Ex. 4.3		Ex. 4.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g)SS	(g)	(g) SS
A	40 DE syrup	84	0.00	0	0.00	0	0.00	0	0.00	0
	60 DE syrup	80	56.61	45.29	66.55	53.24	76.49	61.19	81.46	65.17
	95 DE fructose syrup	70	0.00	0	0.00	0	0.00	0	0.00	0
B	GENUTINE® carrageenan	100	0.00	0	0.00	0	0.00	0	0.00	0
	GENUGEL® carrageenan	100	1.00	1	1.00	1	1.00	1	1.00	1
C	Water 1:1	0	38.22	0	26.23	0	14.24	0	8.25	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.67	11.67	13.72	13.72	15.77	15.77	16.79	16.79
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

Ex. 5.1

Preparation of an aerated food composition (mashmallows)

Aerated confectioneries (marshmallows) were produced according to the following table:

Table II

Component	Ingredients	% SS	(g)	(g) SS
A	Water	-	16.00	-
	Sucrose	100	46.00	46.00
	Glucose syrup (DE-39)	84	18.00	15.12
	Invert syrup	75	19.00	14.25
B	Water	-	13.50	-
	GENUTINE™ type X-8300	100	1.12	1.12
	GENU® Agar type 900-A1	100	0.45	0.45
C	Water	-	6.50	-
	Icing sugar	100	3.00	3.00
	Hyfoama® DSN	100	0.40	0.40
D	Flavour and colour		Optional	
	Evaporation		23.97	
	Yield		100.00	
	Yield soluble solids			80.34

A sugar syrup is prepared by mixing the components (A) and heating to the boiling point. Separately a dispersion of carrageenan and a further hydrocolloid in the form of GENU® agar type 900-A1 is dispersed in 90° C water (Component B)) while stirring with a high speed mixer for two minutes. Component (B) is added to component (A) and

boiled to 86% of soluble solids. Separately therefrom the ingredients of component (C) is mixed and beaten to a stiff foam.

The mixture of component (A) and (B) is slowly added to component (C) while whipping and beating for about three minutes at high speed.

Thereupon, optional flavour and colour are added, and the slurry is deposited immediately in a hot state in a manner analogous to example 1.1.

Ex 6.1

Preparation of a high sugar glazing

A high sugar glazing was produced according to the following table.

Table III

Component	Ingredients	% SS	(g)	(g) SS
A	GENUGEL® carrageenan X-8605	100	0.4	0.4
	Sucrose	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6
B	Water	-	18.0	-
C	Sucrose	100	20.0	20.0
D	Glucose syrup**	80	60.0	48.0
E	Potassium sorbate 20% w/v	20	0.5	0.1
F	Citric acid 50% w/v	50	1.4	0.7
	Evaporation		4.9	
	Yield		100.0	
	Yield soluble solids			74.0

** Cerestar FT 01700.

The ingredients of Component (A) are dry-blended and dispersed in component (B) and heated to boiling to dissolve the carrageenan. Component (C) is added while heating, whereupon Component (D) is mixed thereto under continued heating. The heating is continued to obtain a soluble solids content in the range of 73 to 75%, whereupon Component (E) as a preservative and Component (F) as a buffer is added. The composition is deposited as disclosed in ex. 1.1.

The texture of the above food composition is short, creamy and very transparent. It can be melted without dilution by heating to 60 to 70° C. However, it may also be diluted by about 20% of water to obtain a glazing suitable for fruit and ice cream tarts.

Ex. 6.2 to 6.4

Further glazing compositions were produced analogously with the above disclosed procedure. The recipes used appear from the below table IV.

Table IV

Component	Ingredients	Ex. 6.2			Ex. 6.3			Ex. 6.4		
		% SS	(g)	(g) SS	% SS	(g)	(g) SS	% SS	(g)	(g) SS
A	GENUGEL®	100	0.4	0.4	100	0.4	0.4	100	0.4	0.4
	Carrageenan X-8605									
	Sucrose	100	4.0	4.0	100	4.0	4.0	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6	100	0.6	0.6	100	0.6	0.6
B	Water	-	20.0	-	-	17.0	-	-	15.0	-
C	Sucrose	10.0	17.0	17.0	100	22.0	22.0	100	27.0	27.0
	Glucose syrup*	80	60.0	48.0	80	60.0	48.0	80	60.0	48.0
D	Citric acid 50% w/v	50	1.4	0.7	50	1.4	0.7	50	1.4	0.7
	Evaporation		3.4			5.4			8.4	
	Yield		100.0			100			100	
	Yield soluble solids		70.7				75.7			80.7

* CERESTAR FT 01700

The texture of the products of ex. 6.2 to 6.4 is pleasantly soft, creamy and short.

Test results of the above compositions appear from the table VI below.

Experimental results

Measurement methods:

Texture, pH and content of soluble solids are performed as follows:

Texture

The textures of the deposited samples are caracterised by the following parameters: Break strength (BS) (in grams of force), at 5°C, Gel strength (in grams of force), at 5° C at a 2 mm, 4mm, and 8 mm compression distance, and Distance to break (DT) at 5° C, which parameters are measured with the Texture Analyzer on test samples deposited in Bloom glasses.

Break strength.

The Break strength (BS) is determined as the force (in grams) required to compress the sample to break with a 0.5" (1.25 cm) diameter probe.

Gel strength.

The Gel strength is determined as the force (in grams) required to compress the gel 2, 4, and 8 mm, respectively, with the 0.5" (1.25 cm) diameter probe.

Distance to break.

The Distance to break (DT, Distance Travelled) is determined as the distance (in mm) it takes to break the gel.

In these experiments the probe speed is 1 mm/sec.

Refractometer.

Part of the gel from one of the Bloom glasses is used for measurement of soluble solids in a refractometer, available as from Bellingham & Stanley Ltd., Great Britain, with range 40 to 80% SS or 75 to 93% SS.

Depositing temperature.

Said temperature is measured with a thermometer placed in the centre of a depository funnel. The depositing temperature is read as the temperature just before the material is non-flowable.

Bloom glasses: Pyrex ® glas cylinders of a diameter of 70 mm and a height of 40 mm, available from Bibby Sterilin Ltd., Stone, Staffordshire, Great Britain.

Test results for examples 1.1 to 4.4 and 6.2 to 6.4 appear from the below Tables V and VI, respectively.

Table V

Test results for examples 1.1 to 4.4, soft candies (wine gums)

		Ex. 1.1	Ex. 1.2	Ex. 1.3	Ex. 1.4	Ex. 2.1	Ex. 2.2	Ex. 2.3	Ex. 2.4
% SS		60	70	80	85	60	70	80	85
Sucrose:Non sucrose		60:40	60:40	60:40	60:40	20:80	20:80	20:80	20:80
DE of non sucrose		~DE 60	~DE 60	~DE 60	~DE 60	DE 60	DE 60	DE 60	DE 60
TA.XT2 measurements in Bloom glasses									
Gel strength	2 mm (g)	6.7	6.8	7.1	10.4	6.0	6.9	8.4	12.5
	4 mm (g)	15.3	16.2	17.0	22.3	14.1	16.3	18.5	24.9
	8 mm (g)	40.0	41.2	43.4	52.4	37.2	41.0	44.3	55.1
BS (g)		739	873	1111	1611	660	830	970	1020
DT (mm)		29.6	29.8	30.0	30.0	29.3	30.0	30.0	25.0
Depositing temperature (°C)		74-76	84-86	95-98	100	76-78	84-86	94-96	100-105
pH		3.8	3.8	3.9	3.9	3.8	3.9	3.9	3.8
% SS (calculated)		60.0	70.0	78.0	82.0	60.0	67.0	79.0	83.0

Table V (cont.)

		Ex. 3.1	Ex. 3.2	Ex. 3.3	Ex. 3.4	Ex. 4.1	Ex. 4.2	Ex. 4.3	Ex. 4.4
% SS		60	70	80	85	60	70	80	85
Sucrose:Non sucrose		20:80	20:80	20:80	20:80	20:80	20:80	20:80	20:80
DE of non sucrose		DE 95	DE 95	DE 95	DE 95	DE 60	DE 60	DE 60	DE 60
TA.XT2 measurements in Bloom glasses									
Gel strength	2 mm (g)	9.3	8.1	8.8	10.5	298	347	194	118
	4 mm (g)	18.8	17.6	19.2	23.4	623	706	546	379
	8 mm (g)	44.1	42.8	45.2	55.4	254	395	1335	1234
BS (g)		453	555	714	1454	417	534	1403	2140
DT (mm)		26.4	27.1	30.0	30.0	27.4	29.2	9.1	14.1
Depositing temperature (°C)		67-69	74-76	86-88	98-100	53	63	86	76
pH		3.8	3.8	3.7	3.8	3.9	4.0	4.0	4.0
% SS (calculated)		57.0	68.0	79.0	82.0	65.0	68.0	79.0	83.0

To further illustrate the textural behaviour of soft candies (wine gums) comprising carrageenan, gelatine or pectin, respectively, as gelling agent, four curves are presented in Fig. 1, illustrating the compression force as a function of the compression distance.

The texture of the product of example 2.3 and a corresponding product comprising a carrageenan according to copending US appl No 09/124,970, filed 30 July 1998, appears from the annexed Fig. 1 together with two reference compositions gelled by means of pectin or gelatine, respectively.

The composition of said pectin gelled product appears from the below table I (comparative).

Table I (comparative)

Component	Ingredients	% SS	(g)	(g) SS
A	Water	-	30.0	-
	Sodium citrate, $2H_2O$	100	0.4	0.4
	Citric acid, H_2O	100	0.37	0.37
B	Genu® pectin	100	1.5	1.5
	Sucrose	100	5.0	5.0
C	Sucrose	100	46.4	46.4
	Glucose syrup (DE~40)	80	30.0	24.0
D	Citric acid, H_2O, 50% w/v	50	0.75	0.38
	Total ingredients		114.0	78.05
	Evaporation		14.0	
	Yield		100.0	78.1

The composition of the above referenced gelatine gelled product appears from the below table II (comparative).

Table II (comparative)

Component	Ingredients	% SS	(g)	(g) SS
A	Sucrose	100	45.0	45.0
	Glucose syrup(DE ~42)	84	30.0	25.2
	Water	-	10.0	-
B	Gelatine, 180 Bloom, 37.5% w/w	37.5	18.4	6.9
C	Citric acid, 50% w/v	50	2.5	1.25
	Flavour and colour	optional		
	Total ingredients		105.9	
	Evaporation		5.9	
	Yield		100.00	78.0

It appears from Fig. 1 that the gel strength of pectin gelled products (▲) increases rapidly during compression. However, the break strength thereof is very modest. This means that the texture of pectin gelled products is firm and brittle.

In contrast, the gel strength of gelatine gelled products (■) increases much slower than pectin gelled products, and they do not exhibit any break strength. This means that gelatine gelled products are very chewy and rubbery.

Products gelled with Genutine® X 8300 carrageenan (●) show a similar increase in gel strength as gelatine gelled ones at small compression distances, but carrageenan gelled products break when compressed, however, at around 50% higher compression force than pectin gelled products. This illustrates the fact that such a carrageenan gelled product is much more rubbery and chewy than pectin but slightly less rubbery than gelatine.

A product gelled by means of Genutine® experimental carrageenan (▲) behaves to a large extent in the same way as gelatine in terms of chewiness and rubberyness. Thus, the resistance to compression of a Genutine® experimental gelled product continues to increase during compression (perceived as chewiness during eating).

The ratio between gel strength and break strength can also be used to indicate the degree of chewiness and rubberyness. Thus, for pectin gelled products the gel strength is high, while the break strength is low, whereas for gelatine gelled products the gel strength is moderate and the break strength is high. For carrageenan gelled products the gel strength can vary and so can the break strength. This means that carrageenan gelled products can be obtained with a variety of textures from firm and brittle pectin like textures to gelatine like chewy, elastic and rubbery textures.

Finally, the distance travelled to break is a strong indication of rubberyness, a long distance indicating a larger degree of rubberyness.

Table VI

Test results for examples 6.2 to 6.4, glazings

		Ex. 6.2	Ex. 6.3	Ex. 6.4
% SS		70.7	75.7	80.7
Sucrose:Non sucrose		30:70	35:65	40:60
DE of non sucrose		62	62	62
TA.XT2 measurements in Bloom glasses				
Gel strength	2 mm (g)	93	93	35
	4 mm (g)	185	238	112
	8 mm (g)	181	239	333
BS (g)		274	347	444

The above description of the invention reveals that it is obvious that it can be varied in many ways. Such variations are not to be considered a deviation from the scope of the invention, and all such modifications which are obvious to persons skilled in the art are also to be considered comprised by the scope of the succeeding claims.

Claims

1. A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance.

2. The composition according to claim 1, wherein the non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.

3. The composition according to claim 1, wherein the non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 40, preferably a DE > 40 fructose or glucose syrup.

4. The composition according to claim 1, wherein the sucrose can be replaced wholly or partly by an aqueous solution of a sugar alcohol, such as sorbitol, mannitol, xylitol, isomalt, lactitol, maltitol or a maltitol syrup.

5. The composition according to any one of the claims 1 to 4, wherein the ratio of sucrose to non sucrose sweetener is from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2.

6. The composition according to claim 5, wherein the non sucrose sweetener is a fructose or glucose syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to 90, especially about 60 to 70.

7. The food composition according to any one of the claims 1 to 6, wherein at least about 80%, preferably at least about 90% of the soluble solids are comprised by said sweetening system.

8. The composition according to any one of the claims 1 to 7, wherein the carrageenan component is an iota carrageenan or a kappa carrageenan or mixtures thereof.

9. The composition according to claim 8, wherein the carrageenan is present in an amount of about 0.25 to 10.0% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition.

10. The composition according to claim 9 further comprising as additional gelling agent a hydrocolloid selected from the group comprising pectin, agar-agar, alginates, carboxy methyl cellulose, methyl cellulose, hydroxy propyl cellulose, curdlan, xanthans, gelatine, starch and gum arabic in an amount of up to about 10.0% by weight of the food composition.

11. The composition according to any one of the claims 1 to 10, wherein the soluble solids further comprise one or more ingredients selected among milk solids, vitamins, minerals, food grade acid, flavouring, colouring, artificial sweeteners and preservatives.

12. The composition according to any one of the claims 1 to 11, wherein the food composition is a high sugar confectionery.

13. The composition according to claim 12, wherein the food composition is soft candies.

14. The composition according to any one of the claims 1 to 12, wherein the composition is an aerated confectionery and further comprises a whipping agent.

15. The composition according to any one of the claims 1 to 12, wherein the composition is a glazing.

16. A process for producing a food composition according to any one of the claims 1 to 13 comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing of the mixture and (e) cooling of said mixture to below the depositing temperature of said mixture.

17. The process according to claim 16, wherein sucrose, if any, is added in step (c).

18. The process according to any one of the claims 16 to 17, wherein the temperature sufficient to disperse the carrageenan in the syrup of the non sucrose sweetener is from at least about 50, especially at least about 60° C.

19. The process of any one of the claims 16 to 18, wherein one or more ingredients selected among milk solids, vitamins, minerals, food grade acid, flavouring, colouring, artificial sweetener and preservative is added between steps (c) and (d).

20. The process according to any one of the claims 16 to 19, wherein in step (d) the hot mixture is deposited in moulds.

21. A use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30.

22. The use according to claim 21, wherein the carrageenan is an iota carrageenan or a kappa carrageenan or mixtures thereof.

for Hercules Inc.
CHAS. HUDE A/S

Abstract

A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance.

Said food composition may be produced by a process comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing of the mixture and (e) cooling of said mixture to below the depositing temperature of said mixture.

The food composition gels rapidly and forms a gel at temperatures of below 100°C. The food composition is especially confectionery products such as soft candies, marshmallows or glazings.

Fig. 1